



# AFS-205 FEDERAL AVIATION ADMINISTRATION NATIONAL SIMULATOR PROGRAM



## Flight Simulation Training Device Qualification Guidance

---

### Flight Simulator Qualification for New or Derivative Aircraft FSTD Guidance Bulletin 04-01

---

1. **Purpose:** This bulletin provides guidance for the Federal Aviation Administration (FAA) qualification of Level 6 through level C flight simulation training devices (FSTD) for an aircraft prior to receiving an FAA Type Certificate or a major design change that requires amending an existing type certificate.
2. **Overview:** The National Simulator Program (NSP) is responsible for ensuring an FSTD accurately replicates the aircraft and that it meets airman training, testing and checking requirements for the aircraft. In the past, the NSP has qualified some simulators for new aircraft when NSP inspectors had not served on the FSB or had adequate aircraft flight experience. In addition, several qualifications have taken place well in advance of the FSB review and FAA type certification. These situations have led to instances where the FSTD did not replicate the aircraft and/or significant changes had been made to the aircraft that were not incorporated into the FSTD in a timely manner. To help ensure that the NSP meets its responsibilities, the following procedures will be followed.
3. **Interim FSTD Qualifications:** Traditionally, the NSP has used interim qualifications to provide the sponsor with a qualified device prior to a full flight test package being available for the airplane to validate the FSTD's performance. Typically, the data package consists of a certain amount of actual airplane flight test data supplemented with data provided from an engineering simulator validated with 'proof of match' data. The primary reason for the interim qualification is to prevent training or checking in the FSTD at full level D credits due to the lack of complete device validation with aircraft data. It is also noted that interim status is intended to be a temporary qualification level that is a direct function of the completeness of the aircraft data package. In all qualifications where preliminary or predicted data is used to validate the performance of an FSTD, the NSP expects reasonable assurance that the preliminary data is the aircraft manufacturer's best representation of the aircraft and that the final data package will not significantly deviate from the preliminary data. The NSP currently provides for two levels of interim qualifications:
  - a. **Interim Level C:** Interim level C qualification generally requires that a significant portion of the Qualification Test Guide (QTG) cases be validated with aircraft flight test data. In addition, the aircraft flight test validated QTG cases must represent a reasonable cross section of the aircraft's performance



# AFS-205 FEDERAL AVIATION ADMINISTRATION NATIONAL SIMULATOR PROGRAM



## Flight Simulation Training Device Qualification Guidance

---

and handling characteristics. The remaining QTG cases may use sources other than airplane flight test data, such as engineering simulator data or airplane flight manual data. The airplane manufacturer or FSTD manufacturer should provide a Validation Data Roadmap (VDR) to the NSP. A VDR is a document that clearly identifies (in matrix format) sources of data for all required qualification tests in the QTG. It also provides validity with respect to engine type and thrust rating and the revision levels of all avionics that affect airplane handling qualities and performance. The VDR must be acceptable to the NSP Manager.

- b. **Interim Level B:** The NSP recognizes that several aircraft manufacturers have been able to accurately predict aircraft flight performance and handling characteristics with a high degree of reliability. In recognition of this fact, the NSP will consider the expanded use of alternate, engineering and/or predicted data for use as the primary validation data source in the QTG. In cases such as this, a complete QTG will still be required, albeit with minimal airplane flight test data used for validation. To justify this expanded use of predicted and/or engineering data, the data provider and FSTD manufacturer must demonstrate to the NSP that they have the ability to reliably predict the performance of aircraft under development and implement such predictions in an FSTD. In determining the justification for using expanded alternate validation data, the NSP will consider factors such as previous experience in using predicted data in the development of aerodynamic math models, previous experience in using a VDR in conjunction with a simulator qualification, and previous experience in building FAA qualified FSTDs. A complete VDR should be provided to the NSP as soon as possible prior to the development of the QTG. Generally, the NSP will only consider the airplane manufacturer as a suitable validation data provider for new aircraft under development. Due to the inherent amount of uncertainty in using predicted data as the primary source of validation data for an FSTD, such qualifications will be limited to an Interim B level.
4. **Provisional Status:** The NSP recognizes that aircraft manufacturers and training providers have an interest in training crews as soon as possible during the development of a new aircraft to enable operation of such aircraft as soon as possible after type certification is completed. The NSP also recognizes that during the course of type certification, design changes may be made to the aircraft to address certification issues. Such changes made to the aircraft may alter the basis to which the FSTD was designed. As a result, all qualifications to FSTDs of non-type certificated aircraft will be granted with provisional status. The intent of provisional



# AFS-205 FEDERAL AVIATION ADMINISTRATION NATIONAL SIMULATOR PROGRAM



## Flight Simulation Training Device Qualification Guidance

---

status is to limit the number and types of crewmembers trained in an FSTD that could later be modified as a result of design changes to the aircraft. A qualification with provisional status limits the use of the FSTD to training, testing, and checking of the initial cadre of manufacturer's pilots, initial cadre of airline/training center instructors, FSB members and FAA participants. The Draft FSB Report must be completed, outlining any training/testing/checking requirements for the aircraft, and the FSTD must provide the means to accomplish those requirements for the FSTD to be qualified as interim level C. Additionally, due to the possibility of required changes to the validation data package as a result of modifications to the aircraft, all qualifications with provisional status will be limited to interim level C. Thus, the highest possible qualification that can be granted for an FSTD of an aircraft that has not yet been type certificated is Interim C, with provisional status. Note that provisional FSTD status is only applicable to non-type certificated aircraft.

5. **Qualification Procedures:** Normal FSTD qualification procedures should be followed with the addition of the following items.
  - a. **Formal Notification** – As soon as reasonably possible, the sponsor should formally notify the NSP of the intent to qualify an FSTD for a new aircraft. The sponsor should provide as much information as possible to the NSP concerning projected aircraft certification dates.
  - b. **Simulator Evaluation Team (SET) Formation** – Upon receipt of formal notification from the sponsor, the NSP will form a SET for the FSTD qualification. A SET is normally composed of the following personnel:
    - **NSP Inspector**
    - **NSP Engineer**
    - **Aircraft Evaluation Group (AEG) Inspector.** Normally, the inspector will be the Chairperson of the Flight Standardization Board (FSB) for the aircraft.
    - **Aircraft Certification Test Pilot and Flight Test Engineer.**
    - **Technical Advisors.** At the discretion of the chairperson, technical advisors from the FAA Certificate Holding Office may be invited to attend.
    - **SET Chairperson.** The NSPM will designate one of the SET participants to serve as the SET Chairperson.
  - c. **SET Responsibilities**



# AFS-205 FEDERAL AVIATION ADMINISTRATION NATIONAL SIMULATOR PROGRAM



## Flight Simulation Training Device Qualification Guidance

---

- Coordinate the FSTD qualification with the FSTD sponsor, aircraft and FSTD manufacturers, and other regulatory authorities as appropriate.
- Determine when the FSTD is ready for evaluation.
- Ensure the appropriate FAA personnel are available to conduct the evaluation of the FSTD.
- Determine the FSTD meets the FAA qualification requirements.
- Determine that the FSTD is capable of meeting the flight crew training, testing and checking requirements established by the FSB.

### d. Validation Data Roadmap (VDR) and FSTD Qualification Plan

**Submittal** – The FSTD sponsor must submit a VDR to the NSPM as soon as practical. In addition to the VDR, the sponsor should also provide as much information as possible concerning the progress of the aircraft type certification and FSTD data collection status with respect to the requested date of the FSTD qualification.

### e. Additional Requirements

- The NSP engineer and inspector will normally be assigned for the entire process, to include the full qualification of the device, and will regularly apprise the sponsor of timing issues with respect to the intended “ready for training” date.
- The NSP inspector may serve as a member of the Flight Standardization Board (FSB). Whether the NSP inspector is a member of the FSB or not, he/she must be provided sufficient flight experience to adequately evaluate the FSTD. The inspector may assist with the aircraft certification to gain experience and knowledge of the aircraft.
- FSTD manufacturers and sponsors must update the SET Chairperson on the project status throughout the aircraft certification and FSTD qualification process.
- If an NSP inspector is not a member of the FSB, the FSB Chairperson must keep the SET chairperson apprised of any changes to the aircraft configuration or status that would effect the certification of the FSTD.

### f. Qualification Level/Status – The SET will review the VDR, qualification plan, and all relevant information concerning the progression of the aircraft type certification and make a determination as to the highest level of FSTD qualification possible for the requested evaluation dates.



# AFS-205 FEDERAL AVIATION ADMINISTRATION NATIONAL SIMULATOR PROGRAM



## Flight Simulation Training Device Qualification Guidance

---

- **Full Qualification** – In this case, a complete data package is expected with the Qualification Test Guide (QTG) and the aircraft will be fully type certificated at the time of the FSTD qualification. In addition, prior to the scheduled evaluation, the sponsor of the FSTD must submit a statement that either there are no performance, handling, or functional differences between the production aircraft and the FSTD model or, if there are differences, describe in detail what those differences are.
  - **Interim Qualification** – In this case, a complete flight test data package is not expected with the QTG. Interim level B or level C will be determined as per section 3 of this document based upon the contents of the validation data package. The aircraft is or will be fully type certificated at the time of the FSTD qualification with no significant differences between the production aircraft and the FSTD model.
  - **Provisional Status** – If the aircraft is not expected to be type certificated by the date of the FSTD qualification date, qualification with provisional status may be granted when the members of the SET agree that there is an adequate amount of systems information, performance data, operational knowledge, and/or flight experience with both the simulator and the aircraft.
  - **No Qualification** – Insufficient airplane validation data exists to support the qualification or the aircraft has not completed significant portions of its type certification.
- g. **QTG Submittal** – It is encouraged that a preliminary copy of the QTG including the reference data but minus the FSTD results is provided to the NSP as soon as it can be made available. Otherwise, normal QTG submittal procedures should be followed with emphasis on timely submission. Additionally, the sponsor of the FSTD must submit a statement that either there are no performance, handling, or functional differences between the production aircraft and the FSTD model or, if there are differences, describe in detail what those differences are.
- h. **FSTD Evaluation** – Following a successful evaluation, a statement of qualification will be provided that clearly states any limitations on the use of the FSTD due to interim or provisional status.
- i. **Upgrade/Status Changes**
- **Interim Qualifications** – Interim FSTD qualifications are intended to be temporary in nature, normally being valid for up to two years. As



# AFS-205 FEDERAL AVIATION ADMINISTRATION NATIONAL SIMULATOR PROGRAM



## Flight Simulation Training Device Qualification Guidance

---

soon as possible after additional validation data can be integrated into the QTG, the NSP or SET will conduct additional evaluations as necessary to remove or upgrade the interim qualification. Note that major changes to the QTG will generally require a submission in advance of the evaluation date.

- **Provisional Status** – A provisional status can be removed from an FSTD only after the aircraft receives a an FAA Type Certificate in accordance with Title 14, Code of Federal Aviation Regulation (14CFR) Section 21.21. The NSP/SET may conduct an evaluation for any changes to the qualification basis. Furthermore, the NSP Manager may grant extensions to, revoke, suspend, or amend the Provisional Status qualification of the FSTD on a case-by-case basis.

6. **Conclusion:** This document is intended to provide definitions on interim and provisional status FSTD qualifications and explains the reason behind limiting FSTD qualifications in such a manner. Since the qualification of FSTDs of new aircraft types is not a routine matter, the above outlined procedures have been drafted to include some flexibility due to the inevitable special cases that typically appear. As with all cases such as this, the NSP will be in a much better position to exercise flexibility if advance notification and arrangements are made.